April 4th, 1906.—R. S. Herries, M.A., Vice-President, in the Chair.

The following communication was read:—

'The Carboniferous Succession below the Coal-Measures in North Shropshire, Denbighshire, and Flintshire.' By Wheelton Hind, M.D., B.S., F.R.C.S., F.G.S., and John T. Stobbs, F.G.S.

This paper opens with a critical account of previous research among the Carboniferous rocks of North Wales, chiefly the work of the late G. H. Morton, Mr. R. Kidston, and Mr. A. Strahan. There follows a detailed account of the various beds, exposed in numerous quarries worked for road-metal, iron-manufacture, lime, cement, chert, or building-stone. Fossil-lists are given from each exposure of importance. The lower series of the Carboniferous Limestone, as developed in the Bristol area, was never deposited in this district, where the lowest beds contain fossils characteristic of a comparatively-late phase of the Carboniferous-Limestone Period. Whether this was due to irregular configuration of the ocean-floor of that age, or to contemporaneous earth-movement of a regional character, cannot as yet be determined. The base of the Limestone is characterized by *Daviesiella (Productus) llangollensis*, and appears to correspond with the junction of the Upper *Seminula*- and Lower *Dibunophyllum*-Beds of the Bristol area. The next limestones in ascending succession are characterized by the presence of *Dibunophyllum* φ and *Cyathophyllum Murchisoni*, fossils which indicate, in the Bristol area, the life-zone which immediately underlies the *Lonsdalia*-Beds. These two life-zones have been named by Dr. Vaughan the Lower and Upper *Dibunophyllum*-Zones respectively. The *Cyathaxonia*-Beds and the cherts are equivalent to a zone higher than the Upper *Dibunophyllum*-Zone of Bristol, and not represented there. The black limestones (containing *Posidonomya Becheri*) with shales, at Teilia, Holywell, and near Bagillt, which occur above the cherts, are the homotaxial equivalents of the Pendleside Series. These beds are followed by the Gwespyr Sandstone, which is correlated with the Millstone Grit. A range-table is given of the chief brachiopods and corals, and the palæontological sequence is compared with that occurring at Bristol and in the North of England. A few notes on the palæontology conclude the paper, and Dr. R. H. Traquair appends a short description of a new species of *Elonichthys*, occurring in the Holywell Shales.

MISCELLANEOUS.

On the Anatomy and Histology of the Ixodidæ.

By A. Bonnet.

This note is concerned with the study of the eye and of the poison-glands of the Ixodidæ, as well as with that of certain

peculiar organs of these Acarina, the nature of which has not up to the present been established.

I. *Porous area.*—We know that in the females of the Ixodidæ there are found on the dorsal surface towards the base of the rostrum two finely punctured depressions called porous areas. Authors have been content to point them out without indicating their exact nature; I think that it may be inferred from my observations that these two pits represent a sensory organ.

In sections the porous area is seen to be composed of a series of apertures or pores which pass right through the chitin, and, when regarded as a whole, exactly recall the appearance of a sieve. Beneath each aperture there lies an ovoid nerve-cell with a central nucleus. The nerve-cells terminate on the dorsal side in short prolongations in the shape of little rods, which penetrate into the apertures of the porous area. By their other extremity they are attached to a bundle of nerve-fibrils, which spreads itself out widely in the form of a fan on the under side of the organ. In a series of sections the nerve can be traced fairly easily as far as the latero-anterior region of the brain, where it originates.

By reason of its structure there seems no doubt that the porous area represents a sense-organ that may be compared with the lyriform organs and their analogues of the Arachnids. Nevertheless, there is in this case a more marked specialization, since this organ exists only in the females.

II. *Eye.*—The eyes of the Ixodidæ are of the simple type, that is to say, they are composed of a crystalline lens, a vitreous body, and retinal cells. The lens set in the chitin of the cephalothorax, of which it is but a simple differentiation, is white, hyaline, and strongly convex; in *Hyalomma affine*, Neumann, it is 150 μ thick and has a diameter of 100 μ. It is not composed of concentric lamellæ, but exhibits striæ perpendicular to its surface; these striæ are numerous and accentuated by a black pigment contained in the crystalline substance. Beneath the crystalline lens the hypodermis is prolonged to form the vitreous body, which is composed of low compressed cells. This body is bounded by a circular zone of tall cells, corresponding to the irisated zone or tapete of the Arachnids. The retinal portion comprises a small number of ovoid nerve-cells of large size (30 μ by 20 μ), with posterior nuclei, as in the nocturnal eyes of the spiders and in those of the Opilionidæ. I have not found coloured pigment either between the retinal cells or upon the margin of the vitreous body, as we see it regularly in the other Tracheata.

We find, then, that the eyes of the Ixodidæ diverge in certain respects from those of the Arachnids, and are characterized: (1) by the great thickness of the lens and the strong curvature of the crystalline body; (2) by the presence of black pigment in the crystalline body; (3) by the absence of pigment between the retinal cells and in the irisated zone; (4) by the great size of the nerve cells.

III. *Poison-glands.*—Among the pluricellular alveoli of the salivary glands we find a certain number of bulky pyriform cells, which are distinguished from the other gland-cells by their affinity for the acid stains. Studying these cells at different stages, I perceived that they form unicellular glands, which open into the salivary ducts by a short canal. These glands are situated exclusively upon the three great trunks of the excretory canals. I consider these histological elements to be poison-glands; they are, moreover, much more numerous in the species of *Argas* than in those of *Ixodes*, a fact which explains easily enough the greater degree of irritation caused by the bite of the former when compared with that inflicted by the latter.

In the resting condition (that is to say, in individuals which have been detached from their host for a certain time) the nucleus of these cells is regular in shape, rounded, and sharply defined. At the moment of secretory activity the nuclear membrane disappears, and the nucleus sends out irregular prolongations, especially on the side of the aperture of the gland. These prolongations become detached from the central mass, and break up into nuclear granulations which are entirely identical with the venogenous granules observed in the poison-glands of Arthropods and snakes.

The cytoplasm stains readily with eosin, and is finely granular. Nevertheless, around the nucleus and the nuclear granulations it exhibits a hyaline zone of slight plasmic density; this zone is more or less extensive, according to the bulk of the mass of chromatin contained in it. The chromatic granulations appear to dissolve in the cytoplasm, and modify it in order to produce the toxic substances.

It seemed to me interesting to notice these nuclear emissions, which here undoubtedly play a highly important part in the phenomena of secretion, and probably participate in the formation of poison in the gland, as Launoy, in his researches upon poison-glands, has shown to be the case.—*Comptes Rendus*, t. cxlii. no. 5 (Jan. 29, 1906), pp. 296–298.

The Large Dermal Glands of the Species of Echinaster.

By Dr. Philipp Bartheels.

In his work "Die Seesterne des Mittelmeeres" ('Fauna und Flora des Golfes von Neapel,' Bd. 24, 1897) Ludwig speaks on page 320 of the large dermal glands of the species of *Echinaster*; he describes their occurrence especially in *Echinaster sepositus*, Gray, and says that in their longest diameter the glands measured from 0·6 to 0·8 mm. After the removal of the epithelium covering the body he was already able to recognize the glands with the help of a lens, by means of the white coloration in the large meshes of the cutis, by which each one is surrounded. They had sometimes a rounded and sometimes a more elongate outline, or one in which